JOURNAL *of* THE SOCIETY OF CHEMICAL INDUSTRY

CHEMISTRY & INDUSTRY

Official Organ of the Institution of Chemical Engineers, of the Coke Oven Managers' Association, and of the Federal Council for Chemistry

which consists of Representatives from

The Chemical Society, the Society of Chemical Industry, the Association of British Chemical Manufacturers, the Institute of Chemistry, the Society of Public Analysts, the Faraday Society, the Institute of Brewing, the Society of Dyers and Colourists, the Society of Glass Technology, the Iron and Steel Institute, the Ceramic Society, the Institution of Gas Engineers, the Society of Leather Trade Chemists, the Royal Photographic Society, the Mineralogical Society, the Biochemical Society, the Oil and Colour Chemists' Association, the Institute of Metals and the Royal Agricultural Society.

VOL. 52 — LONDON, MAY 19, 1933 — NO. 20

EDITORIAL

A New Cold Record

IT is announced in the *Daily Telegraph* that a new low temperature record has been achieved in the Kamerlingh Onnes laboratory at Leyden by Profs. de Haas, Kramer, and Wiersma. They have obtained a temperature of 0·27° K., that is on the absolute scale. It is said that the low temperature was obtained by bringing cerium fluoride into a strong magnetic field and suddenly reducing its energy, but we have not come across any details of the method. The Kamerlingh Onnes laboratory has an honourable record in connexion with low temperatures, far outstripping the earlier efforts. Cailletet and Pictet about the year 1877 did excellent work but did not succeed in obtaining liquid oxygen or hydrogen. Liquid oxygen was obtained by Wroblewski and Olszewski about the year 1883, and liquid air by Wroblewski in 1885, although liquid air was not readily available until after 1891. Liquid hydrogen was obtained by Dewar in 1898 and ten years later Kamerlingh Onnes obtained liquid helium. Probably he then reached so low a temperature as about 3° or 4° K. but in later years he was able to reach lower temperatures, the very lowest being about 0·8° K. To get below this is a very difficult operation and though in the future the record set up by Profs. de Haas, Kramer, and Wiersma may be broken this will be no easy task. It remains to be seen whether these new temperatures will assist us to learn something new about the electrical and magnetic properties of matter.

Weed Destruction

The many uses and virtues of sulphuric acid are known to us all: there was a time when the prosperity of a nation could be measured in terms of the amount of sulphuric acid that it cousumed. We have been proud to number among our friends those whom we have seen busy exterminating the daisies on their lawns with the aid of a bottle of sulphuric acid and a long glass tube, particularly since we now find they were but the primitive expression of what is about to be an important new use for sulphuric acid. For it has been found that it is an economic and even profitable operation to kill the weeds, particularly charlock, in the cereal crops by spraying with dilute sulphuric acid. The fact that the acid spray harms charlock and some other weeds and yet has no action on cereals is due to morphological differences between the two plants. In cereals and grasses the outer layer of the leaf is thick and not easily penetrated and the tender growing point is protected by the wrapping round of the leaves. The skin of charlock is delicate and easily penetrated, and the growing point is exposed. The cereal in large measure withstands the dehydrating and plasmolysing action of the acid but the charlock quickly turns brown and dies. Spraying should take place when the cereal is about four to five inches high; normally a fifteen to one solution of strong B.O.V. is used in a quantity of a hundred gallons to the acre, unless the weed is tall when a larger quantity is advisable. In a fortnight after treatment the weed has disappeared and the crop has recovered and presents a healthy and luxuriant appearance. Surprising results have already been obtained from this treatment: thus at Jealott's Hill the yield of oats both in grain and straw increased more than fifty per cent, and ninety five per cent of the charlock was destroyed. Elsewhere on continuous wheat-growing land it will be possible to fallow one year in five instead of one in three as the result of the elimination of the weeds. The process is on its trial in England but it has been entirely successful in France where many thousand tons of sulphuric acid are now used annually for the treatment of several hundred thousand acres: a good deal of experience has thus been gained. Of late years farmers have found it extremely difficult to keep their land clean owing both to the cost of the necessary labour and the fact that the damp summers prevented the use of the hoe. The discovery of a method of killing weeds which is at once effective, economical, and independent of the weather marks a great advance. Sulphuric acid has played the part of the farmer's friend in many guises, as the partner of ammonia in ammonium sulphate, and as the solvent of rock phosphate, so that it will be given a warm welcome in its spray form. Sulphuric acid has become the handmaid of agriculture as well as the life-blood of industry. Farming is no longer a question of hard manual work: mechanized implements of all kinds are driven up and down the land to plough, to spread fertilizers, to sow, to eradicate weeds, to harvest; operations must be on a larger scale if the abounding fertility of our countryside is to be developed to the full extent.

SCIENTIFIC PRINCIPLES OF LOW-GRADE GAS

By DAVID BROWNLIE

More attention than ever is now being given to fuel technology in relation to the national interests, especially as regards the home production of liquid fuel by low-temperature carbonization and hydrogenation, and the use of coal instead of imported petroleum.

In this connexion, of outstanding importance is the work of George Helps at Nuneaton in regard to low-grade gas and the science of flame. Research work is being actively continued, and highly interesting is one of the latest developments, the use of low-grade gas in houses on the "all-in" system, replacing coal or other solid fuel entirely, and providing all the heat and light required by means of gas at a lower net cost than with coal. Nuneaton is the only town in the world being operated with cheap low-grade gas of 200 B.Th.U. per cb. ft., and is also the only town to be supplied entirely with manufactured gas made by low-temperature carbonization methods, with the production of 20 gallons of high-grade tar, really a crude oil, per ton of coal.

The story of the long-continued work at Nuneaton, commencing so far back as 1902, is fascinating. Essentially the fundamental researches of George Helps on the science of flame are in my opinion the most important ever undertaken in this field, ranking with those of Davy and Bunsen. The practical results however, are much more striking since it has been demonstrated beyond question that a rich towns gas of say 400—600 B.Th.U. per cb. ft. is unnecessary for towns supply, and a 200 B.Th.U. gas, made at much less cost per heat unit supplied, will give actually superior results.

It is well known that towns gas is made from coal by high-temperature carbonization methods in horizontal, inclined, or vertical retorts or by-product coke ovens, and is often mixed with total gasification gas in the shape of water gas. High-temperature carbonization gas is generally 500—600 B.Th.U. per cb. ft. whilst the "blue" water gas, 300 B.Th.U. per cb. ft. as made from coke, is carburetted as required with heavy oil to give a carburetted gas, say 350—550 B.Th.U. Almost all towns gas in the United Kingdom is supplied within the range of 400—600 B.Th.U. per cb. ft. at a pressure of 3—4 in. W.G. and an approximately average price to the domestic consumer of say 9d. per therm (100,000 B.Th.U.). Further, the cost of manufacture of this rich gas can be taken as 5d. per therm (100,000 B.Th.U.) being an approximate average for the 1600 gas works concerned. At Nuneaton the principle adopted is entirely different, only combined low-temperature carbonization and partial gasification gas being used, operated on simple lines according to several methods, including for example the "Midland Coal Products" process. There is obtained direct a 200 B.Th.U. gas which is supplied at 8 in. W.G. works pressure at a price which is a revolution in gas practice. The total cost of the gas into the holder is 2·0d. per therm (100,000 B.Th.U.) under the difficult conditions of Nuneaton, a small town of 50,000 inhabitants with 6000 scattered gas users and 36 miles of mains. That is the gas is cheaper in the proportion of 2 : 5 compared with the average for the country, and in the case of a large town the figures would be down to 1 : 5, so that gas could be sold in bulk at 1·25—1·50d. per therm. At present gas at Nuneaton is being sold to many domestic consumers at 4·0—6·0d. per therm, half the average price of gas in the United Kingdom.

The most remarkable development, as already indicated, is that the Nuneaton Gas Company is now supplying a number of houses at 4d. and 5d. per therm, entirely replacing coal, and costing the consumer less money. The most detailed records have been taken in connexion with a number of these houses before and after the operation with low-grade gas. In a typical case the house (with 6 rooms) used originally per annum 5 tons of coal at £2 per ton, with 70,000 cb. ft. of gas for partial cooking and heating at 9d. per therm. This represents £15 5s. per annum, £10 for coal and £5 5s. for gas. Eventually the house was fitted throughout with low-grade gas appliances, no coal being used. In 1932 the consumption was 600 therms of low-grade gas (300,000 cb. ft.) charged at 5d. per therm, costing £12 10s., about 82% of the former fuel bill, a saving of £2 15s. per annum. This of course is only rendered possible by the use of cheap low-grade gas.

Nuneaton has been running successfully since 1926 on 200 B.Th.U. gas and it is hardly necessary to point out that all the objections raised against this principle have been proved to be entirely without foundation. For example, there is no extra leakage, the same mains and pipes as before are used, the total extra power, in the form of a small booster, is less than 5 h.p. for the whole of Nuneaton, and the flame temperature of a 200 B.Th.U. gas is substantially equal to that of the richest gas, 600 B.Th.U. or over.

The time is obviously long overdue for a complete reconsideration of the whole principle of the use of gaseous fuel, especially as the easy production of liquid fuel on a very large scale is involved.

INDUSTRY IN MADRAS

The Report of the Department of Industries in Madras for 1932 emphasizes the great need for changes in the agricultural policy of the Madras Presidency. It is pointed out that there is no reason why much of the land now devoted to growing rice should not be utilized for crops such as sugar cane, some 80,000 tons of sugar having been imported during the year. The figures with regard to silk production are of considerable interest. Sixty years ago silk production in India was very much on a par with that of Japan, but to-day Japan produces 65% of the world's silk and India less than 1%.

The amount of mining in the Presidency showed considerable reduction during the year. Only 5433 t. of manganese were mined, as compared with 35,000 in 1929, whilst the output of mica magnesite, barytes, and asbestos was also much lower. The tanning industry—which is of considerable importance in S. India—also showed less activity. The evidence of the report regarding sugar manufacture is that there is considerable scope for improved methods of extraction, with the employment of centrifugals and centralization of supplies in small factories.

SOCIETY OF CHEMICAL INDUSTRY

OFFICIAL NOTICES

Annual Meeting.—Newcastle-on-Tyne. July ... 14 inclusive. His Majesty the King has graciously conferred his patronage on the meeting. A preliminary programme appeared in our issue of March 31. Full details with application forms will be circulated to members by post about the end of this month.

The Council has reappointed Dr. R. T. Colgate as Hon. Treasurer for the session 1933—1934, and Dr. E. F. Armstrong as Hon. Foreign (Overseas) Secretary for the same period.

Collective Index to Abstracts. The Collective Index to the Abstracts for the years 1923 to 1932 inclusive covering both the A and B Abstracts (Pure and Applied Chemistry), is in active preparation, and printing will commence very shortly. The work will occupy more than 900 quarto pages, and the Author Index will be ready for issue about April, 1934. As the number printed will be strictly limited, those members and subscribers who have not already ordered the Index should do so without delay. The price (post free) is £4 to members of the Society of Chemical Industry or Fellows of the Chemical Society and £8 to others.

Food Group. The arrangements for the annual general meeting on Friday, May 26, at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, are as follows:

4.45 p.m.—Tea by invitation of the Metropolitan Branch of the Society of Medical Officers of Health.

5.0 p.m.—Joint Meeting with above Branch. "The Prevention of Industrial Diseases of the Skin," by Dr. Haldin-Davis, followed by discussion to be opened by Dr. Howard Mummery.

6.30 p.m.—Business of the Annual General Meeting. (approx.)

7.0 p.m.—Cinematograph Film "From Orchard to (approx.) Home." Chivers.

MEMBERS ELECTED

May 12, 1933

Bach, S. F., Anglo-Persian Oil Co., Ltd., P.O. Box 1, Chertsey Road, Sunbury-on-Thames.

Cllingham, William Ernest, c/o Utilities Improvements, Ltd., 2, Thames House, Queen Street Place, London, E.C. 4. Chemical Engineer.

Chester, Cyril Arthur, Duke Street, Princes Risboro, Bucks. Chemist.

Hanmer, H. Rupert, Research Department, The American Tobacco Company, 25th and Cary Sts., Richmond, Virginia. Director, Research Laboratory.

Kerr, Gerald Malcolm Theodore, 7, Christchurch Road, East Sheen, London, S.W.14. Post Graduate Student, University College, London.

Lloyd, Rees Vernon, Technical College, Cardiff. Head of Welsh College of Pharmacy.

Pedder, *John Saxon*, 129, *Bristol Road*, *Edgbaston*, Birmingham. Research Chemist.

Read, Frederick Charles Edward, James Keiller & Son. Ltd., Tay Wharf, Silvertown, London, E. Chemist.

Wright, Alfred Edward, P.O. Box 17, Georgetown, British Guiana. Chemist and Druggist.

Zimmerli, Dr. William F., E. I. du Pont de Nemours & Co., Bush House, Aldwych, W.C.2. Chemist.

CHEMICAL SOCIETY

A discussion on "Substitution in Organic Compounds" was held at the University of Leeds on May 12, the president, Prof. G. T. Morgan, O.B.E., F.R.S., occupying the chair. The president said that the visit was in pursuance of a policy, recently inaugurated by the Council of the Society, to carry its activities further afield than London, but it was not intended to institute local sections. In view of the movement leading towards amalgamation of various chemical organisations, the new policy was a gesture on the part of the Society and a move to come into contact with other societies in the provincial centres.

The discussion was opened by Prof. G. M. Bennett, whose contribution was as follows:

Influence of Nuclear Halogens on Side-chain Reactivity.

The side-chain reactivity data for a number of different reactions have been reviewed. When the nuclear substituents are arranged in the order of their influence on reaction velocity, a series is obtained which is usually one of continuous rise or continuous fall of inductive effects. The halogens as a group are found, in general, in their expected place in this series, and yet, as was pointed out by Shoppee (1930—1932), the order of the halogens may be inverted within the group.

New data for the velocities of the two reactions of a series of substituted phenyl chloroethyl sulphides with potassium iodide (I) and with water (II) provide the first case in which this halogen anomaly is clearly shown for one reaction (II) but not for the other (I) with a single set of substances.

The possibility is examined of accounting for these results in terms of electronic displacements (whether temporary or permanent).

Prof. R. Robinson's contribution, presented by Dr. J. C. Smith, was as follows:

Electronic Displacements and Activation in Simple and Conjugated Unsaturated Systems.

The part played by electromeric effects in various types of reactions is considered and a recent memoir by Baddeley and Bennett in which novel suggestions are put forward in regard to the genesis of the electromeric effect of the halogens is discussed.

Exception is taken to these suggestions and an alternative view is advanced depending on the consideration of the relative polarisibility of the halogen atoms. It is thought that the reactions considered by Baddeley and Bennett are not such that the true electromeric effects should play an important rôle.

The importance of considering the formal electromeric systems and the desirability of confining their application to clear-cut cases in which the systems themselves take a part in the reactions treated are emphasised.

Dr. J. C. Smith contributed a discussion of some recent experiments on the chlorination of salts of benzoic

acid in alkaline solution. Here the orientation found is o- > m- > p-. This indicates a diminishing general effect of the anionic charge in these positions.

Dr. C. W. Shoppee then discussed :

Effect of Nuclear Halogens on Triad Prototropic Systems.

The fact that, for a series of nuclear substituents (m or p), the mobility of simple triad prototropic systems of the type

$$R{\cdot}C_6H_4{\cdot}X = Y - Z[H]Ph \underset{k_2}{\overset{k_1}{\rightleftharpoons}} R{\cdot}C_6H_4{\cdot}X[H] - Y = ZPh$$

follows strictly the order of the dipole moments of the compounds

$R - C_6H_5 : NMe_2 < Me < OMe < I < Br < Cl < NO_2$

leads to the inference that such systems constitute a unique and specially simple aromatic side-chain reaction of "type B" (Ingold and Rothstein, J., 1928, 1217).

In no other case of side-chain reactivity of "type B" does the influence of substitution (m or p) on reaction velocity follow the dipolar sequence. The anomalies observed relate to ambipolar groups ($-I + T$) such as the methoxyl group and the halogens, the latter *becoming inverted among themselves.*

The suggestion is made that, in general, aromatic *side-chain reactions of both "type A" and "type B"* involve, in a single mechanism, two rate-affecting phases *of opposite polar character (compare the treatment of* equilibria in triad prototropic systems, J., 1931, 1225). Under such conditions the velocity coefficients for ambipolar substituents will lie on a curve possessing a single maximum. The same series: OMe, I, Br, Cl, F, represents not only increasing electron attraction ($-I$) *(facilitating one polar phase), but also decreasing* electron release ($+T$) (facilitating the oppositely polar phase), and this progression is used as a key to analyse possible curves.

Several curves are possible, because the position of the maximum will vary according to the weighting, by molecular circumstances, of the opposing polar phases and their facilitation.

The discussion was then continued by Dr. G. N. Burkhardt, Mr. M. G. Evans, Prof. Bennett, and Prof. Robinson.

After an interval for dinner, Prof. C. K. Ingold discussed :

Significance of the Reactions of Aromatic Compounds in Electronic Theories of Reactivity.

The internal polar properties of atoms and groups may be classified either according to time-dependence or according to mechanism. The characteristics distinguished in the former classification differ in their physical dimensions (just as μ and α in $m = \mu + \alpha F$). The effects categorised in the latter method of classification differ in the source of their energy. The two classifications are not quite co-extensive and their inter-relationship is considered. Therefore in addition to the inductive effect an inductomeric effect is recognised, the two being distinguished by their differing time-dependence. The tautomeric effect is split up *into the mesomeric and electromeric effects on the same* basis. Anomalous examples of orientation, reaction the point of view indicated. The energy of the tautomeric effect is regarded as arising from a form of wave mechanical degeneracy.

Dr. J. W. Baker then discussed :

Anomalies in the Reactivities of Side-chain Halogens.

Kinetic analysis, under identical experimental conditions, of the two types of reaction

$$\underset{\overset{\nearrow}{NC_5H_5}}{R{\cdot}CH_2} \overset{a}{\rightarrow} X \longrightarrow R{\cdot}CH_2{\cdot}\overset{\oplus}{N}C_5H_5\}\overset{\ominus}{X} \quad \ldots \quad (I)$$

$$\underset{\overset{\uparrow}{NHPh}}{R{\cdot}CH_2} \overset{a}{\rightarrow} \underset{\overset{\downarrow}{H}}{X} \longrightarrow R{\cdot}CH_2{\cdot}NHPh + HX \quad \ldots \quad (II)$$

NHPh–H
δ – δ +

shows that, in both cases, when $R = p\text{-}Y{\cdot}C_6H_4{\cdot}CO{\cdot}$ the velocity is increased by electron recession from the side-chain (type B), but when $R = p\text{-}Y{\cdot}C_6H_4{\cdot}$ it is increased by electron accession to the side-chain (type A), as determined by the effect of p-substituents of the clear-cut polar types $\pm I$ (*e.g.*, Me and NO_2). Nevertheless, in the latter case, the velocity decreases in the order $X = I > Br \gg Cl$, *i.e.*, in the inverse order of their $-I$ effects. Apparent anomalies are also observed in the effect of p-halogen substituents on the velocities.

In all reactions of such types the possible influence of the various factors, (a) the separation of X as an anion, (b) the co-ordination of the negatively polarised portion of the attacking molecule at the group adjacent to X, and, in some cases, (c) the affinity of the unshared halogen electrons for the positively polarised hydrogen, *on the resultant velocity is considered, especially in* relation to the validity of deductions regarding the polar *character of substituent groups made on the basis* of such velocity measurements.

Prof. H. M. Dawson discussed :

Substitution of Halogens in Aliphatic Ions and Molecules.

The elimination of bromine from the $- CH_2Br$ group has been studied in kinetic experiments with sodium bromoacetate, bromoacetic acid and mixtures of the acid and salt, and the measurements show that the *process is, in general, the result of four simultaneous* and independent reactions. When the considerable disturbances caused by the reaction products and by variations in the salt content of the reaction medium are reduced to a minimum by appropriate methods, the observed reaction velocities over a wide range of conditions can be satisfactorily represented by the equation $v = v_1 + v_2 + v_3 + v_4 = k_{1'}[Ion]{\cdot}[H_2O] + k_{2'}[Ion]^2 + k_{3'}[Mol]{\cdot}[H_2O] + k_{4'}[Mol]{\cdot}[Ion]$.

By varying the composition of the solution, any one of the four component reactions may be made to play the chief part in the actual change.

The bimolecular velocity coefficients, which can be evaluated with considerable precision, are widely different in magnitude as is evident from the appended relative values which refer to 25° and a standard salt content.

Reaction	Mol + H_2O	Ion + H_2O	Ion + Ion	Mol + Ion	Mol + Mol
Relative					

It thus appears that collisions between bromoacetic acid molecules and bromoacetate ions or between pairs of ions are vastly more effective than collisions in which a molecule of water is involved. On the other hand, collisions between pairs of bromoacetic acid molecules would seem to be ineffective.

Preliminary observations with other halogen-substituted acids and salts show similar relations.

Further contributions were made by Prof. Kenner and Prof. Lapworth, and the discussion was then summarised by Prof. Robinson.

An account of the informal contributions to the discussion will appear in a forthcoming issue of CHEMISTRY AND INDUSTRY.

The Chemical Society's Dinner was held in the University Refectory, Prof. G. T. Morgan, F.R.S. presiding. There was a large attendance of about a hundred including many chemists from Leeds and the vicinity. After the usual loyal toasts, Prof. R. W. Whytlaw Gray, F.R.S., of Leeds University, proposed the toast of the Chemical Society and called attention to the importance of the discussion that had taken place and the honour conferred upon Leeds, this being the first occasion when such a discussion had taken place at such a gathering outside London. He thought it was very helpful to the younger chemists in the provinces who sometimes scarcely realised sufficiently the great part played by the Chemical Society in the development of the science. It is the oldest chemical society in the world, and for more than 90 years has been the focus of British chemistry and has devoted the whole of its resources to furthering the advancement of chemistry by its publications, its encouragement of research, and its many other activities. It was the duty of every chemist to support the Society and the present generation should uphold the splendid tradition handed down. In reply Prof. Morgan referred to the great names of the past associated with Leeds, Thorpe, Smithells, Perkin, and Green, and to the great names of the present including Profs. Whytlaw Gray, Challenger, and Ingold.

BIOCHEMICAL SOCIETY

The following is an abstract of a paper which was read before the Biochemical Society on May 6 (cf. CHEM. & IND., May 12, pp. 420—422):

"Method of Comparing the Catatorulin Potency of Crystalline Vitamin-B_1 Preparations," by R. Passmore, R. A. Peters, and H. M. Sinclair.

The factor in vitamin B_1 concentrates, which restores oxygen uptake to avitaminous pigeon's brain in lactate solutions, is most probably the vitamin itself, but to avoid possible confusion it is termed "catatorulin." It can be estimated, as compared with a standard, by use of the Michaelis equation, if allowance is made for residual catatorulin in the tissue. Crystalline vitamin B_1 (Kinnersley, O'Brien, and Peters, 1933*) exerts perceptible effects in concentration of 0·1 γ in 3·0 c.c. solution and 100 mg. tissue. With 1 γ the action is almost maximal. There is marked parallelism between vitamin-B_1 and catatorulin activities in different crystalline specimens; and the preparation of Windaus *et al.* previously shown to be less active than (1) in vitamin-B_1 is less potent also in catatorulin. The constant for the factor indicates a very high affinity.

* Biochem. J., 1933, 27, No. 1.

BRITISH ASSOCIATION OF CHEMISTS

The annual meeting of the Notts and Derby Section was held in King's Café, Derby, on May 1, with Mr. E. A. Chapman in the chair. There was an excellent attendance, both of members and friends. The hon. secretary, Mr. T. P. Dee, presented a report of a year of successful activity and increased membership. Apart from the business of the Association, the Section had taken its part in providing a programme of meetings for Derby chemists through the Derby chemists' joint committee. Addresses had been given by Dr. Lampitt, Mr. J. Arthur Reavell, Mr. H. T. F. Rhodes, and Mr. F. Scholefield, and a very successful dance had also been held.

The officers and committee for the ensuing session were elected as follows: *Chairman:* E. A. Chapman; *Hon. Treasurer:* W. B. Miller; *Hon. Secretary:* J. Allan; *Committee:* A. Betesta, S. B. Bratley, J. W. Fisher, J. C. Hibbert, J. Lister, T. Ockman, J. P. Rogers, S. Spray, F. Stanbridge, J. Turnbull, and H. Woods.

Prof. E. C. C. Baly, C.B.E., F.R.S. gave a most interesting address, unfolding the story of eleven years of research on the photosynthesis of carbohydrates. A discussion was opened by the chairman, and continued by Messrs. J. Bower, R. W. Blount, S. B. Bratley, and W. F. Gibson.

In replying to a vote of thanks, Prof. Baly stated his strong belief in the future of the Association and his gratification at having been elected president. The proceedings concluded with an informal dinner.

CORRESPONDENCE

HYDROGENATION

SIR,—The public is about to add a new word—hydrogenation—to its vocabulary, acquiring it, like it has many other new words, in association with motoring.

The word is not a new one to the scientist or to the more serious minded who have watched the controversy about the financing of the hydrogenation of coal. It is now to be popularized by its association with a lubricating oil which, as the result of hydrogenation, is claimed to possess all the virtues. Whilst it is pleasing to be told that hydrogenation is destined to make our lives more comfortable and more economical, I do consider it desirable to plead that when scientific progress of this kind is introduced to the public some reasonable degree of descriptive accuracy should be enforced on the promoters and their experts.

Whilst I am not concerned with the accuracy of the claims made for a hydrogenated lubricating oil, I am at least astonished at some of the statements attributed to Prof. A. M. Low at the time of its introduction. It is not within my knowledge for example that sugar is made from sawdust by hydrogenation. Prof. Low may someday discover the word "hydrolysis" as appropriate to describe this new miracle, also ranking with radio activity in importance, to use his words. Neither are

oils broken in pieces during hydrogenation, which is in the main a matter of addition of hydrogen to a double bond.

I refrain from further similar criticisms for the case for hydrogenation is a strong one without such misrepresentation, and it should be an obligation for technologists to maintain accuracy even when they seek to give simple popular explanations of scientific processes.

I am, Sir, etc.,
E. F. ARMSTRONG.

London, E.C.4
May 9, 1933

PERSONAL AND OTHER ITEMS

The Senate of the University of Belfast has resolved to confer the honorary degree of D.Sc. on Prof. Samuel Smiles, F.R.S., Daniell Professor of Chemistry at King's College, London, since 1920, and prior to that Professor of Organic Chemistry at Armstrong College, Newcastle.

The University of Sheffield has appointed Mr. W. R. Maddocks, B.Sc., lecturer in metallurgy; Mr. J. Dick, B.Sc., assistant lecturer in mechanical engineering, and Mr. A. J. Macdougall assistant lecturer in metallurgy.

We regret to record the death recently of Prof. J. T. J. Morrison, F.R.C.S., who occupied the Chair of Forensic Medicine in the University of Birmingham from 1908 to 1932.

The Mining and Geological Institute of India has nominated Mr. B. Wilson Haigh as its representative on the Council of the Institute of Fuel to fill the post formerly held by Prof. Charles Forrester of the Indian School of Mines.

Dr. Ernest Vanstone, who is in charge of the chemical department of Seale-Hayne Agricultural College, Newton Abbot, Devon, has been elected chairman of the South Western Counties Section of the Institute of Chemistry. Prior to his present appointment Dr. Vanstone held appointments at H.M. Explosive Factory, Pembury, and with the British Dyestuffs Corporation.

Mr. F. P. Boyley of Buxton, partner in the firm of Boyley, Clanahan & Co., chemical manufacturers, left estate of the gross value £8461, with net personalty £6942.

The Society's Medal

The Society of Chemical Industry has awarded its Medal this year to Prof. W. A. Bone, D.Sc., Ph.D., F.R.S. Prof. Bone has chosen as the subject of his address, which will be given at the annual meeting at Newcastle, "Forty Years in Combustion Research." A portrait of Prof. Bone and a brief biography appeared in CHEMISTRY AND INDUSTRY in our issue of February 5, last year, p. 114, on the occasion of the presentation to him of the Melchett Medal by the Institute of Fuel.

Commonwealth Fund Fellowships

The Committee of Award of the Commonwealth Fund Fellowships has made appointments to 20 Fellowships tenable by British graduates in American Universities for the two years beginning September, 1933. Among those appointed are the following: Mr. J. F. Danielli, B.Sc., University College, London, to Princeton University, in chemistry; Mr. S. H. Jones, M.Sc., University of Wales, to Johns Hopkins University, in geology; Mr. R. B. Kinsey, B.A., Trinity College, Cambridge, to the University of California, in physics; Mr. J. H. Lamble, B.Eng., Ph.D., University of Liverpool, to the University of Michigan, in engineering; Mr. A. McLean, B.Sc., Ph.D., University of Edinburgh, to the University of Illinois, in chemistry; Mr. C. E. Marshall, B.Sc., Armstrong College, to the University of Pittsburg, in geology; Mr. H. C. Rowan, B.Sc., Ph.D., University of Birmingham, to the Massachusetts Institute of Technology, in engineering; Mr. J. C. E. Simpson, B.Sc., Ph.D., University of Liverpool, to the Rockefeller Institute, in chemistry.

The Sir John Cass Technical Institute

The close of the present session will mark the completion of the 12th year during which provision has been made at the Sir John Cass Technical Institute for systematic courses of instruction in petroleum technology and allied subjects. The annual report of the Department of Petroleum Technology indicates that the value of the instruction provided is being well appreciated. This year there are 167 students taking the course, which is more than in any previous year except 1930–31, and a distinct advance on 1931–32. The courses provided this year have dealt with the general technology of petroleum, its properties, applications, and examination, and subjects fundamental to and bearing on petroleum technology. An additional course of lectures is being given during the third term of the session on Diesel Engines and on Fuel Oil and its Applications.

The report records the department's sincere regret at the resignation of Prof. J. S. S. Brame from the post of lecturer on "Properties, Applications, and Examination of Petroleum" consequent upon his retirement from the Royal Naval College. Prof. Brame has been associated with this Institute in a teaching capacity since 1909. He has been succeeded by Prof. F. A. Ruddock. This course has attracted a large number of students, a gratifying feature being the return of many old students wishing to extend their practical knowledge and to undertake simple forms of research.

During the session a Petroleum Students' Association has been formed for the purpose of promoting discussions and debates related to petroleum technology and the petroleum industry, to organize and arrange visits to works, and other places of interest, and to offer facilities for the exchange of information and knowledge. It is of interest that the Association has the good wishes of the Institution of Petroleum Technologists and it is hoped, in due course, that a definite connexion will be established between these two bodies.

The Institute is fortunate in having had the services, in addition to Prof. Brame and Prof. Ruddock, of such eminent men as Dr. A. E. Dunstan, Dr. F. H. Garner, Prof. V. C. Illing, Dr. F. B. Thole, and others.

Books in the Universities

In its Blue-book recently issued (H.M.S.O.—1s. 3d.) the University Grants Committee states that during the year 1931–32 there was a fall in expenditure on books of £16,000, with a rise in expenditure on periodicals of £5,000. Detailed examination shows that of the

whole body of students a little more than a half was in the arts group, the next largest groups being medicine, pure science, technology, and agriculture. During the year there were 48,510 students in universities and university colleges who were in receipt of grants from the Treasury. The total income of the universities and colleges amounted to nearly £6,000,000, of which a little more than £2,000,000 was contributed by Parliamentary grants, and £1,856,000, or 31·6%, was derived from fees.

Opening of Titanium Factory

New plant for the manufacture of titanium pigments was formally opened at Luton on May 10 by Dr. E. Leslie Burgin, M.P., Parliamentary Secretary of the Board of Trade, before a gathering which included a number of distinguished members of the chemical industry. The new factory of National Titanium Pigments, Ltd., which is the only one of its kind in England, uses as its raw material ilmenite from Travancore in India. National Titanium Pigments, Ltd., which has manufactured titanium white at Barking for the last few years, came under the control last year of the well-known chemical manufacturing firm of B. Laporte, Ltd., of Luton, and the new factory adjoins this company's previously existing plant for the manufacture of blanc fixe, hydrogen peroxide, etc.

World Production of Artificial Silk

According to figures published in *Die Chemische Industrie* (March 11, 1933), the world production of artificial silk in 1932 was 232,800 metric tons, compared with 140,000 tons in 1927 and 35,000 tons in 1922. The 1932 output represents 80% of the capacity of existing plant. The chief producers were: United States (59,300 t.), England (32,900 t.), Italy (32,100 t.), Japan (29,200 t.), Germany (28,000 t.), and France (21,000 t.). Production in England and Japan showed a very considerable increase compared with 1931, but in Germany and in the United States there was a decline. Over 80% of the 1932 output was by the viscose process.

Coal, Iron, and Steel Production in 1932

In a review of production in Belgium, France, Germany, Poland, the Saar, the United States, and the United Kingdom, in the *Board of Trade Journal*, it is stated that the aggregate production of coal in 1932 totalled 735,000,000 t., as compared with 989,000,000 t. in 1930. The decline in production was smallest in the case of the United Kingdom with 4·6%, whilst other countries showed decreases ranging from 7·5% in France to 24·7% in Poland. The total output of pig-iron fell to 27,600,000 t. as against 42,800,000 t. in the previous year and 64,900,000 t. in 1930. In the United Kingdom the decrease was 5·3%, whilst in the United States, Germany, and France the declines were 52·5%, 35·1%, and 32·3% respectively. The United Kingdom was the only country to show an increase in steel output (1·0%); the decline in steel production in the United States, Germany, and France amounted to 48%, 30·6%, and 28·3% respectively.

Export of Sulphur from Italy

The quantity exported in 1932 was 272,900 t., an increase of 13·5% over 1931. Finland was the chief buyer in 1932 (54,070 t.), France taking 41,670 t., England 36,200 t., and Sweden 34,490 t.

REVIEWS

PAPER TESTING AND CHEMISTRY FOR PRINTERS. By G. A. Jahans, B.A. Pp. ix + 313. London: Sir Isaac Pitman & Sons, 1931. 12s. 6d.

The author in his preface proclaims his purpose as that of providing students entering the paper industry with a single book covering such chemistry as they are likely to find useful, and its application to the testing of the many varieties of paper they are likely to encounter. The book gives the impression that the author is well versed in knowledge of the paper industry and in the testing of papers: in these matters he guides the student well. But in chemistry he is not a safe guide; *e.g.* (p. 7), he describes Alpha cellulose as an oxy-cellulose, and says "the more completely Beta cellulose is broken down and removed before the fibre is used for paper making. . . ." On p. 10 viscose is said to be "Alpha cellulose dissolved in carbon disulphide." This book will, no doubt, be called for in new editions, and it would be worth while, therefore, to have the chemistry of the book revised by a chemist. Apart from this defect the book has definite merits which will appeal to students.

TECHNOLOGIE DER TEXTILFASERN. Edited by Prof. Dr. R. O. Herzog. Physik und Chemie der Cellulose. By H. Mark. Pp. xv + 330. Berlin: J. Springer, 1932. 45 rm.

A decade ago specialists were visualizing cellulose as having a molecule modelled on some sort of system of dextrose residues, three or four of which were imagined arranged and linked ring-wise: its hydrates were spoken of, with a little reserve perhaps, as various chemical compounds: its dispersions were regarded as solutions, and even to-day they still are too commonly designated solutions. This book visualizes the chemistry and physics of cellulose to-day in the light of the momentous changes of this past decade. The powerful implement of *X*-ray analysis, and the classical advances in the chemistry of the carbohydrates, have allowed the question of the ultimate chemical and physical structure of cellulose to be brought to what is, for all practical purposes, a convincing and completely satisfying conclusion.

Some may think there are aspects of this topic, especially industrial, that might have been surveyed in this volume with advantage; but the author's viewpoint, clearly described in his preface, is one from which he volunteers that there are many investigations and advances, often of considerable technical and industrial interest, which are nevertheless of no more general or scientific importance because they apply only to special materials or are qualitative: for his present purpose, therefore, he considers their proper places to be somewhere or other in the more technical and industrial later volumes (some already published) of the whole series in which this monograph is the introductory volume.

The first part of the volume gives an account of the physics of cellulose and the theoretical discussion of its properties on the basis of micellar hypothesis. The reader will turn with special attention to the sections dealing with optical properties, the field in which the author has attained such great distinction, and those

dealing with dispersions and the problems involving the theories of imbibition, viscosity, and so on, of great complexity and importance, in which the author will be found to be an equally trusty guide. Similarly there are sections dealing with the physics of derivatives and degradations of cellulose on the same bases.

The second part of the volume deals with the detailed chemistry of cellulose and always in the notation of micelles, chains of dextrose residues, imbibition, and so on; that is to say, it represents the views consequent on the most recent discoveries and advances. The reader will probably find himself left with the impression that cellulose is a sort of ordered agglomerate of chains of poly-ose homologues, in a sense analogous to the mixture of homologues found in, say, mineral oil.

KUNSTSEIDE. By Dr. O. Faust. 4th and 5th enlarged and re-edited editions. Pp. vii + 316. Dresden and Leipzig: T. Steinkopf. 1931. Paper, 13·50 rm.; bound, 15 rm.

The appearance of a new and enlarged edition will be welcomed by those who have relied upon earlier editions of this work, and by those who may be familiar with an English translation which appeared a few years ago. Dr. Faust is a specialist well known for his many years of competent service to the industry. There are now many reliable books on rayon, and this one ranks among the best; but it must be always remembered, of course, that this industry is one in which empirical personal knowledge plays a very large and important part, and no book can be any substitute for that. The main impression left by this edition, on comparison with earlier editions of this and similar works, is that the industry is developing with ever-increasing intensity over the original front, rather than spreading on to any wider front. In spite of all that has been done to extol the merits of other derivatives of cellulose, *e.g.*, the ethers, the improvements in raw materials and their processings have greatly improved the qualities and lowered the costs of the viscose and acetate products, more particularly, and there appears not the slightest sign, at present, of any prospective developments in any other directions. Dr. Faust's book will be found a faithful guide to all these happenings.

LATEX PRESERVATION AND SHIPMENT. By R. O. Bishop and R. G. Fullerton. Planting Manual No. 4. Pp. 65. Malaya: Rubber Research Institute, 1932. $2.

This is one of a series of booklets published primarily for the benefit of F.M.S. rubber planters; it aims at providing in a concise manner the knowledge requisite for those desirous of undertaking the preparation and shipment of preserved latex. Details are given as to precautions in the field, methods of preparation for shipment (particularly bulking and ammoniation), selection and treatment of containers, probable alterations in characteristics during prolonged storage, methods (especially those based on creaming or evaporation) for the concentration of latex and alternatives to ammonia for preservative purposes. The procedure for sampling is described in simple manner, as are also the operations for the chemical testing of latex and of alkaline preservatives, although minor features of the latter are likely to be criticized by a precise analytical chemist. The matter is well presented and is illustrated by a number of useful diagrams and tinted plates; perhaps unnecessarily, the pagination is discontinuous and recommences (with a different prefix) for each of the eight sections. The booklet will be of much interest; it reflects the progress made during the last few years on the more highly developed estates in meeting the rapidly increasing world-demand for rubber in this form. Indeed the publication helps to break new ground for the public and complements various recent articles and books describing the technical application of rubber latex in numerous manufacturing processes. A few of the statements, *e.g.*, as to the corrosive action of caustic potash solution on metals, might with advantage be modified and elaborated in future editions. Probably also it would be advisable to give the planter-reader more adequate information on the existence of patents covering some of the processes suggested for his adoption.

COMPANY NEWS

DUNLOP RUBBER CO., LTD.

At the 34th annual general meeting of the company held on May 12 the chairman, Sir Eric Geddes, stated that the company and its associated and subsidiary companies was passing through difficult years extremely well. (Financial results, cf. CHEM. & IND., May 5, p. 407). In reorganization a policy had been adopted of concentrating operations in a smaller number of units, which could thus work up to a higher pitch of efficiency. Research, development, and testing laboratories had kept pace with new trends in the automotive industry, and in the tyre division the company had fully maintained its position at home and in overseas markets. Latex development was increasing rapidly, and the new processes were being applied to an ever-widening range of products. The factory for the production of Lastex, a rubber thread which could be woven into fabrics, was now getting into full production.

Sir Eric Geddes stated that the co-ordination of the patent interests of the company with those of the United States Rubber Co., the Pirelli Co., and the Hungarian Rubber Goods Co. was a great step forward. The associated companies in France, Germany, and Japan had maintained their positions surprisingly well, and the quick recovery of Australia from the crisis of 1931—32 was reflected in the position there of the Dunlop Perdrian Co. The Canadian company had made a loss, but the reorganization was now complete and greatly improved results were anticipated.

VAL DE TRAVERS ASPHALTE PAVING CO.

The net profit of the company for 1932 was £3805, as compared with £30,459 in the previous year. A sum of £21,068 is brought forward from last year, and a dividend of 2½% has been recommended as compared with 6¼% last year, and £18,611 is to be carried forward. Floating assets of the company total £224,158, with liabilities £25,597, and the balance-sheet shows interests in subsidiaries to be £286,706.

BRITISH OXYGEN CO. LTD.

The available profit of the company for 1932 is £100,242, an increase of a little more than £30,000 as compared with 1931. During the year the company acquired Metal Industries and Oxygen Industries, the cost of the goodwill, £127,818, being written off by a transfer of £101,448 from capital reserve and the balance from free reserve. A final dividend of 3% is proposed on the ordinary shares, making a total of 5% for the year, as against 3% paid in for 1931. A bonus dividend of 1½% is recommended on the ordinary shares. The company proposes to convert preference and ordinary shares into stock, share certificates being accepted after July 1 as the equivalent of stock certificates.

COSACH

Details have recently been announced of the proposed scheme for the reorganization of Compania de Salitre de Chile. The combine is to disband, as well as the Lautaro Nitrate Co. and the Anglo-Chilean Co., and the liabilities of the companies to each other are to be liquidated. A Sales Corporation is to be organized as from July 1, 1933, which will take over all the nitrate produced, quotas for the purchases being fixed for the various producing companies. The Chilean Treasury will impose a levy of 25% on the profits of the Sales Corporation. The Corporation will be authorized to issue bonds to the total amount of $51,000,000, of which $48,000,000 will be offered in exchange for their nominal value of the total amount of prior secured bonds at present issued. The reconstruction of the Cosach, Lautaro, and Anglo-Chilean companies will be made on an estimate of their respective assets and the issue of preferred and ordinary shares, which will be distributed among creditors and shareholders in an equitable manner.

NEWTON CHAMBERS & CO.

The profit of the company, ironworkers and colliery owners of Sheffield, for 1932 totalled £40,825, an increase of about £5000 compared with 1931. Final dividend on both preference and ordinary shares is declared at 5%, bringing the total for the year to 7½%, less tax, as compared with 6%, tax-free, last year.

INTERNATIONAL LATEX PROCESSES, LTD.

The Societa Italiana Pirelli is to participate in International Latex Processes, the company formed in 1932 to consolidate the patents and technical knowledge of the Anode Rubber Co. and the United States Rubber Co. relating to the use of rubber latex for manufacturing purposes.

THOS. FIRTH & JOHN BROWN, LTD.

The accounts of the company, steel manufacturers, for 1932, show a net loss of £75,950, after providing for debenture and other interest, but with no provision for depreciation. The credit balance brought in was £31,314, and £50,000 has been taken from reserve, the credit balance of £5364 in the profit and loss account being carried forward. The company has a capital of £2,450,000, and preference dividends have been paid up to December 31, 1930.

MARKET REPORT

This Market Report is compiled from special information received from the manufacturers concerned.

Unless otherwise stated, the prices quoted below cover fair quantities net and naked at sellers' works.

The following alterations in prices are reported since the publication of the last Market Report (cf. CHEM. & IND., May 12, 1933, p. 427).

GENERAL HEAVY CHEMICALS

Nickel Sulphate.—£49 per ton d/d.

Nickel Ammon. Sulphate.—£49 per ton d/d.

Potash, Caustic.—£30—£33 per ton. **Potass. Bichromate crystals and granular.**—5d. per lb., net d/d U.K., for spot. Discount according to quantity. Ground, 5¾d. per lb.

GENERAL NOTES

Official Trade Intelligence

The Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1, has received the following inquiries for British goods. British firms may obtain further information by applying to the Department and stating the specific number. *Belgium:* Steel plates (G.X. 12,550). *Canada:* Alum, soda ash, liquid chlorine, rosin, sulphuric acid (643). *Denmark:* Chicle gum (661). *Egypt:* Assay chemicals etc. (F.X. 1766).

Import Duties Advisory Committee

The Import Duties Advisory Committee gives notice that they have under consideration applications for increase of import duty on: (*a*) carbon rods of all sizes for electric batteries; (*b*) domestic, mounted, ornamental, and fancy glassware, including blanks for the production of such articles; (*c*) glass bottles, glass jars, and other glass containers; (*d*) illuminating glassware; (*e*) glass tubes, rods, and bars; (*f*) plate and sheet glass, plain, opal, or coloured, whether bevelled, silvered, or otherwise finished or not, and articles made wholly or partly of such glass.

Any representations which interested parties may desire to make in regard to these applications should be addressed to the Secretary, Import Duties Advisory Committee, Caxton House, Westminster, London, S.W.1, not later than May 29 in the case of carbon rods and not later than June 8 in the case of the other commodities.

The Committee announces that it has decided *not* to make any recommendations in respect of the applications previously advertised for the removal from the free list of peroxide of manganese, whether ground or granulated, and for the imposition of an additional duty upon it.

Croydon Mouldrite

Coloured moulding powders are being employed to an increasing extent by the manufacturers of moulded articles, and the exceptionally large range of coloured powders supplied by Croydon Mouldrite, Ltd., Aldwych House, London, W.C.2, is therefore of more than usual interest. Leaflets printed by this firm illustrate the many attractive articles which can be produced with discriminate use of such coloured powders. The firm has made considerable headway in the industry during

the last twelve months, much of which is due to the fact that every endeavour is made to supply suitable plastic materials for special purposes. Synthetic resins are supplied for the manufacture of laminated materials, insulating varnishes, binders for abrasive wheels and other abrasive products, cold-setting cements for brush manufacture, whilst special moulding materials are produced for the manufacture of face-cream containers, soap containers, ash trays, shock-resisting articles, and heat-resisting articles.

Gilsonite

An interesting natural plastic material is "Gilsonite," an example of which is amongst the exhibits in the Plastics Trade Exhibition at South Kensington. This material, which is found in practically inexhaustible quantities in vertical seams in Utah, is the purest form of bitumen known, having a mineral-matter content of never more than 1%. It has a melting point of 300° C., and its resistance to acid attack and its high dielectric properties make it especially suited to the manufacture of moulded battery boxes and insulating varnishes. For battery boxes Gilsonite is used with a softer bitumen, a filler such as asbestos, and a fibre such as cotton linters.

Gilsonite is marketed in this country by Morris Ashby, Ltd., 17, Laurence Pountney Lane, London, E.C.4. A second production of the firm is Amphibole asbestos fibre, with an iron content of less than 1%. This fibre is of good acid-resisting properties, the loss in sulphuric acid at 1300° F. being less than 5%, a property which makes it particularly suited to use with Gilsonite in the manufacture of battery boxes.

New I.C.I. Dyestuffs

Three important additions to the range of British dyestuffs are announced by Imperial Chemical Industries, Ltd. The first, Dispersol Diazo Black BS Paste, possesses good fastness to washing and light, and is specially suited to dyeing acetate silk fabrics. It is similar in general properties to Dispersol Diazo Black AS but does not mark off during hot pressing. Durindone Orange RS Paste is very suitable for direct printing on cotton, viscose, and silk, giving good results by a potash–Formosul recipe, and producing bright reddish orange shades. It is a hot-dyeing colour and has excellent penetrative qualities, whilst its good fastness to degumming makes it of interest for dyeing natural silk.

The third dyestuff, Acronal Phosphine GS, is of special interest to those engaged in the leather trade for the dyeing of vegetable-tanned leathers, chrome-tanned leathers, and by reason of its fastness to rubbing and perspiration, for hot-lining leathers. The shades obtained by its use are clear golden yellows.

Claude-General Neon Lights, Ltd.

An association of interests has been arranged between this company, which is an associate company of the General Electric Co. and is the largest neon lighting concern in England, and David Allen Neon Displays.

A New Germicide

A new germicide and antiseptic produced by A. Boake Roberts & Co., Ltd., of Stratford, London, E.15, is of special interest in view of its suitability for use in many industrial operations. It has the name "Abracide," and has the advantage over most other germicides of being stable in soap solutions, being of only a slightly acid character. Using a concentrate of 5% Abracide in 10% soap solution, the concentrate is antiseptic and germicidal in dilutions of 1 in 300—that is a dilution of the Abracide itself is 1 in 6000. Tests at this dilution have shown the material completely to inhibit growth of *Mucor* and *Aspergillus* in tan liquors, in which both these organisms are capable of producing considerable decomposition and spoilage of leather goods.

Other uses to which it may be put are the prevention of mould formation with the putrefaction of size in cardboard; for germicidal air sprays; disinfectants for agricultural purposes; road and sewer disinfectants; for preventing skin eruptions among engineering operatives; and for many other purposes in industry.

Directory of Paper Makers

The 57th annual edition of the Directory of Paper Makers contains several features which have not appeared before. A special article deals with the position of the paper trade with regard to tariffs: this deals with the changes which have taken place in the last few years, and will be welcomed by the users of the directory. China clay producers and merchants are listed in this edition and there are other similar additions. Many important changes have been made in the Trade Designations sections. As a directory it loses perhaps some of its conciseness by the fact that advertisements are scattered throughout the book. They would be better kept to the ends.

A. Gallenkamp & Co., Ltd.

Gallenkamp apparatus is known in this country in every school that possesses a laboratory, and a new catalogue just published will be of interest to all those who wish to have the latest information available regarding laboratory furnishing. The catalogue is intended mainly for the science master, and embraces apparatus required for the school examination and courses. Apparatus of purely technical application is eliminated, and the book forms a compact and concise guide to all possible requirements of school chemical, physical, and biological laboratories, whilst it also caters for such subjects as meteorology and physical geography. It is very liberally illustrated, is well printed, and is completed by an excellent alphabetical index.

PUBLICATIONS RECEIVED

SWELLING OF PROTEINS, AND ALLIED PHENOMENA. (Being the series of Papers read at a Special Conference held by the British Section of the International Society of Leather Trades' Chemists at the Leathersellers' Hall, London, on December 1, 1932.) Pp. viii + 124. London: International Society of Leather Trades' Chemists, 1933. 5s. 6d.

THE NORTHUMBERLAND AND DURHAM COALFIELD: THE CARBONISATION OF COAL OF RELATIVELY LOW COKING POWER. THE NORTHUMBERLAND YARD SEAM. Department of Scientific and Industrial Research. Fuel Research. Physical and Chemical Survey of the National Coal Resources No. 26. Pp. vi + 35. London: H.M. Stationery Office, 1933. 9d.